5. Total Maximum Daily Loads

A TMDL prescribes an upper limit on discharge of a pollutant from all sources so as to assure water quality standards are met. It further allocates this load capacity (LC) among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation (WLA), and nonpoint sources, which receive a load allocation (LA). Natural background (NB), when present, is considered part of the load allocation, but is often broken out on its own because it represents a part of the load not subject to control. Because of uncertainties regarding quantification of loads and the relation of specific loads to attainment of water quality standards, the rules regarding TMDLs (Water quality planning and management, 40 CFR 130) require a margin of safety (MOS) be a part of the TMDL.

Practically, the MOS is a reduction in the load capacity that is available for allocation to pollutant sources. The natural background load is also effectively a reduction in the load capacity available for allocation to human made pollutant sources. This can be summarized symbolically as the equation: LC = MOS + NB + LA + WLA = TMDL. The equation is written in this order because it represents the logical order in which a loading analysis is conducted. First the LC is determined. The LC is then broken down into its components: the necessary MOS is determined and subtracted; the NB, if relevant, is quantified and subtracted; and then the remainder is allocated among pollutant sources. When the breakdown and allocation is completed we have a TMDL, which must equal the LC.

Another step in a loading analysis is the quantification of current pollutant loads by source. This allows the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary in order for pollutant trading to occur. Also a required part of the loading analysis is that the LC be based on critical conditions – the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both LC and pollutant source loads vary, and not necessarily in concert, determination of critical conditions can be more complicated than it may appear on the surface.

A load is a quantity of a pollutant discharged over some period of time, and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for “other appropriate measures” to be used when necessary. These “other measures” must still be quantifiable, and relate to water quality standards, but they allow flexibility to deal with pollutant loading in more practical and tangible ways. The rules also recognize the particular difficulty of quantifying nonpoint loads, and allow “gross allotment” as a load allocation where available data or appropriate predictive techniques limit more accurate estimates. For certain pollutants whose effects are long term, such as sediment and nutrients, EPA allows for seasonal or annual loads.

In the following sections, TMDLs are presented for bacteria, temperature, nutrients, and sediment. For each category of impairment and each water quality limited segment (Table 7, page 32), in-stream water quality targets are defined, as are design conditions/target selection, and monitoring points, followed by load analyses for each impaired water body. In addition to bacteria, temperature, nutrients, and sediment, Big Creek, Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek and Rock Creek are also impaired due to a lack of flow and habitat alteration.

(Note: EPA does not consider flow [or lack of flow] or habitat alteration a pollutant as defined by CWA Section 502(6), but rather pollution. Since TMDLs are not required to be established for waterbodies impaired by pollution but not pollutants, a TMDL will not be completed for Big Creek, Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek, and Rock Creek for flow and habitat alteration, even though these waterbodies are certainly negatively altered by flow and habitat alteration.)

5.1 Bacteria TMDLs

Bacteria TMDLs were developed for five out of the six 303(d) listed streams in this report: Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek and Rock Creek.

In-Stream Water Quality Targets for Bacteria

The in-stream water quality target for bacteria was developed to restore full support of the recreational beneficial use for each stream. The in-stream load reduction target is based on the collected values of *E. Coli* organisms per 100 ml during November 2001 through November 2002.

Design Conditions/Target Selection

State standards for waters designated for secondary contact recreation are not to contain E. coli bacteria significant to the public health in concentrations exceeding:

- A single sample of 576 E. coli organisms per one hundred 100 ml;

  or
- A geometric mean of 126 *E.Coli* organisms per 100 ml based on a minimum of five samples taken every three to five days over a 30 day period at any 30 day period throughout the year.

E-coli and other harmful bacterium have a life span of about 24-30 hours outside of warm-blooded digestive tracks ,which is enough time for bacteria sources in the headwaters of a stream to move downstream and into other waterbodies like the Palouse River. Therefore, it is critical that all sources of bacteria be reduced and maintained within state standards to ensure contact recreational beneficial use is protected throughout the Palouse River Subbasin.

The load capacity is the amount of pollutant a water body can receive without violating water quality standards. The load capacity for Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek, and Rock Creek is set at a level that fully supports beneficial uses. Seasonal variations, background levels, and a Margin of Safety (MOS) to account for any uncertainties in the load are calculated within the load capacity.

Monitoring Points

The TMDL compliance points for the bacteria TMDLs are the established monitoring sites, which include the mouths of each stream. Since bacteria can travel throughout the entire stream, beneficial uses must be met throughout each 303(d) stream; therefore, each monitoring site is a compliance point for the bacteria TMDLs.

Deep Creek Load Analysis

Samples collected from the upper (PR7), middle (PR6), and lower (PR5) monitoring sites during the 2002 monitoring season revealed several instantaneous exceedances of the state secondary contact standard for bacteria. These exceedances occurred during December, March, May, and June.

Deep Creek is an intermittent stream; therefore, bacteria TMDLs were only written when discharges were greater than 5 cfs. The mass per unit volumes for the current load, load capacity, load reduction amount, and percentages were calculated based on the discharge data for each exceedance.

An MOS of 10% was applied to the load reduction to ensure the goals of the bacteria TMDL are met.

Until bacteria levels are within state water quality standards, DEQ recommends no Animal Unit Months (AUMs) over the current allotment amount be allowed in the watershed. Table 5-1 displays the bi-weekly monitoring results for bacteria; Table 5-2 displays the current load, load allocations, and load reductions.

Table 5-1. Deep Creek bacteria bi-weekly monitoring results.

Date	PR-5 (E-coli)[1]	PR-6 (E-coli)[1]	PR-7 (E-coli)[1]	PR-5 (discharge)[2]	PR-6 (discharge)[2]	PR-7 (discharge)[2]
11/26/2001	130	240	23	4.67	4.82	1.28
12/5/2001	1700	2400	82	7.17	5.57	0.98
12/19/2001	980	620	26	16.48	23.00	3.01
1/2/2002	16	350	3	5.89	4.20	1.08
1/16/2002	84	160	33	28.39	25.82	6.55
1/29/2002	72	60	23	59.36	51.26	7.58
2/12/2002	84	90	28	39.26	40.24	5.81
2/26/2002	190	40	22	42.00	41.06	23.42
3/12/2002	870	350	73	72.04	67.89	19.75
3/26/2002	690	560	24	50.24	47.77	28.92
4/22/2002	32	30	11	36.26	31.08	24.62
5/7/2002	230	610	11	16.40	14.37	5.54
5/21/2002	200	88	11	5.35	4.85	3.03
6/4/2002	130	31	120	2.61	2.68	1.67
6/18/2002	280	100	1200	1.45	1.65	1.24
7/3/2002	26	20	86	1.09	0.85	0.79
7/16/2002	89	250	440	0.17	0.14	1.05
7/29/2002	DRY[3]	DRY	DRY	DRY	DRY	DRY
8/18/2002	DRY	DRY	DRY	DRY	DRY	DRY
8/28/2002	DRY	DRY	DRY	DRY	DRY	DRY
9/5/2002	DRY	DRY	DRY	DRY	DRY	DRY
9/24/2002	DRY	DRY	DRY	DRY	DRY	DRY
10/7/2002	DRY	DRY	DRY	DRY	DRY	DRY
10/22/2002	DRY	DRY	DRY	DRY	DRY	DRY
11/4/2002	DRY	DRY	DRY	DRY	DRY	DRY
11/18/2002	15	9	120	0.04	0.24	0.42

[1] E-coli Organisms per 100/ml
[2] Cubic feet per second (cfs)
[3] Dry = Dry Creek

Table 5-2. Bacteria nonpoint sources load allocations for Deep Creek.

Source	Month	Current Load (*E.coli* organisms/day)	Load Allocation (*E.coli* organisms/day)	MOS (10%)	Load Reduction (*E.coli* organisms/day)
Unknown (PR5)	Dec	2.99×10^{11}	1.01×10^{11}	1.98×10^{10}	2.18×10^{11}
Unknown (PR6)	Dec	3.26×10^{11}	7.83×10^{10}	2.48×10^{10}	2.73×10^{11}
Unknown (PR5)	Dec	3.95×10^{11}	2.32×10^{11}	1.63×10^{10}	1.79×10^{10}
Unknown (PR6)	Dec	3.49×10^{11}	3.24×10^{11}	2.5×10^{9}	2.75×10^{10}
Unknown (PR5)	Mar	1.53×10^{12}	1.01×10^{12}	5.2×10^{10}	5.72×10^{11}
Unknown (PR5)	Mar	8.49×10^{11}	7.08×10^{11}	1.41×10^{10}	1.55×10^{11}
Unknown (PR6)	May	2.15×10^{11}	2.03×10^{11}	1.2×10^{9}	1.32×10^{10}
Unknown (PR7)	June	3.64×10^{10}	1.75×10^{10}	1.89×10^{9}	2.08×10^{10}

Flannigan Creek Load Analysis

Samples collected from the upper (PR17) and lower (PR16) monitoring sites during the 2002 monitoring season revealed eleven instantaneous exceedances of the state secondary contact standard for bacteria. These exceedances occurred during the months of March, May, June, July, August, September, and October.

The mass per unit volumes for the current load, load capacity, load reduction amount, and percentages were calculated based on the discharge data for each exceedance. An MOS of 10% was applied to the load reduction to ensure the goals of the bacteria TMDL are met.

Until bacteria levels are within state water quality standards, DEQ recommends no AUMs over the current allotment amount be allowed in the watershed. Table 5-3 displays the bi-weekly monitoring results for bacteria; Table 5-4 displays the current load, load allocations, and load reductions.

Table 5-3. Flannigan Creek bacteria bi-weekly monitoring results.

Date	PR-16 (E-coli)[1]	PR-17 (E-coli)[1]	PR-16 (discharge)[2]	PR-17 (discharge)[2]
11/26/2001	100	64	7.07	2.01
12/5/2001	74	19	2.79	1.53
12/19/2001	310	100	14.48	8.42
1/2/2002	30	46	2.14	1.62
1/16/2002	56	58	9.79	5.58
1/29/2002	53	63	18.07	11.85
2/12/2002	50	73	19.12	10.41
2/26/2002	28	46	30.84	27.66
3/12/2002	610	440	44.72	35.99
3/26/2002	120	81	37.78	34.25
4/22/2002	10	38	23.50	24.00
5/7/2002	210	410	14.91	12.42
5/21/2002	2400	1600	9.91	10.62
6/4/2002	390	410	3.48	5.84
6/18/2002	340	690	2.03	2.02
7/3/2002	110	2400	1.21	1.50
7/16/2002	310	670	0.72	0.77
7/29/2002	280	2400	0.38	0.36
8/18/2002	54	600	0.10	0.17
8/28/2002	43	43	0.21	0.34
9/5/2002	17	1000	0.22	0.33
9/24/2002	46	2400	0.08	0.18
10/7/2002	16	860	0.27	0.42
10/22/2002	1	450	0.33	0.46
11/5/2002	11	170	0.26	0.40
11/18/2002	20	13	0.78	0.91

[1] E-coli Organisms per 100/ml
[2] Cubic feet per second (cfs)

Table 5-4. Bacteria nonpoint sources load allocations for Flannigan Creek.

Source	Month	Current Load (*E.coli* organisms/day)	Load Allocation (*E.coli* organisms/day)	MOS (10%)	Load Reduction (*E.coli* organisms/day)
Unknown (PR16)	Mar	6.65×10^{11}	6.28×10^{11}	3.7×10^{9}	4.07×10^{10}
Unknown (PR16)	May	5.81×10^{11}	1.39×10^{11}	4.42×10^{10}	4.86×10^{11}
Unknown (PR17)	May	4.16×10^{11}	1.50×10^{11}	2.66×10^{10}	2.93×10^{11}
Unknown (PR17)	Jun	3.35×10^{10}	2.79×10^{10}	5.6×10^{8}	6.16×10^{9}
Unknown (PR17)	Jul	8.83×10^{10}	2.12×10^{10}	6.71×10^{9}	7.38×10^{10}
Unknown (PR17)	Jul	1.27×10^{10}	1.09×10^{10}	1.8×10^{8}	1.98×10^{9}
Unknown (PR17)	Jul	2.09×10^{10}	5.02×10^{9}	1.59×10^{9}	1.75×10^{10}
Unknown (PR17)	Aug	2.44×10^{9}	2.34×10^{9}	1.00×10^{7}	1.10×10^{8}
Unknown (PR17)	Sep	8.17×10^{9}	4.71×10^{9}	3.46×10^{8}	3.81×10^{9}
Unknown (PR17)	Sep	1.04×10^{10}	2.51×10^{9}	7.89×10^{8}	8.68×10^{9}
Unknown (PR17)	Oct	8.94×10^{9}	5.99×10^{9}	2.95×10^{8}	3.25×10^{9}

Gold Creek Load Analysis

Samples collected from the upper (PR8) and lower (PR9) monitoring sites during the 2002 monitoring season revealed five instantaneous exceedances of the state secondary contact standard for bacteria. These exceedances occurred during the months of November, December, August, September, and October.

The mass per unit volumes for the current load, load capacity, load reduction amount, and percentages were calculated based on the discharge data for each exceedance. An MOS of 10% was applied to the load reduction to ensure the goals of the bacteria TMDL are met.

Until bacteria levels are within state water quality standards, DEQ recommends no AUMs over the current allotment amount be allowed in the watershed. Table 5-5 displays the bi-weekly monitoring results for bacteria; Table 5-6 displays the current load, load allocations, and load reductions.

Table 5-5. Gold Creek bacteria bi-weekly monitoring results.

Date	PR-8 (E-coli)[1]	PR-9 (E-coli)[1]	PR-8 (discharge)[2]	PR-9 (discharge)[2]
11/26/2001	21	2400	7.07	2.01
12/5/2001	28	91	2.79	1.53
12/19/2001	60	650	14.48	8.42
1/2/2002	38	110	2.14	1.62
1/16/2002	15	46	9.79	5.58
1/29/2002	26	190	18.07	11.85
2/12/2002	24	75	19.12	10.41
2/26/2002	0	16	30.84	27.66
3/12/2002	74	130	44.72	35.99
3/26/2002	13	32	37.78	34.25
4/22/2002	15	27	23.50	24.00
5/7/2002	4	24	14.91	12.42
5/21/2002	11	46	9.91	10.62
6/4/2002	19	15	3.48	5.84
6/18/2002	24	110	2.03	2.02
7/3/2002	110	350	1.21	1.50
7/16/2002	300	290	0.72	0.77
7/29/2002	440	23	0.38	0.36
8/18/2002	1100	28	0.10	0.17
8/28/2002	130	13	0.21	0.34
9/5/2002	84	2400	0.22	0.33
9/24/2002	490	27	0.08	0.18
10/7/2002	580	22	0.27	0.42
10/22/2002	190	3	0.33	0.46
11/4/2002	35	1	0.26	0.40
11/18/2002	15	28	0.78	0.91

[1] E-coli Organisms per 100/ml
[2] Cubic feet per second (cfs)

Table 5-6. Bacteria nonpoint sources load allocations for Gold Creek.

Source	Month	Current Load (*E.coli* organisms/day)	Load Allocation (*E.coli* organisms/day)	MOS (10%)	Load Reduction (*E.coli* organisms/day)
Unknown (PR9)	Nov	1.18×10^{11}	2.82×10^{10}	8.98×10^{9}	9.88×10^{10}
Unknown (PR9)	Dec	1.34×10^{11}	1.19×10^{11}	1.5×10^{9}	1.65×10^{10}
Unknown (PR8)	Aug	2.59×10^{9}	1.35×10^{9}	1.24×10^{8}	1.36×10^{9}
Unknown (PR9)	Sep	1.96×10^{10}	4.71×10^{9}	1.49×10^{9}	1.64×10^{10}
Unknown (PR8)	Oct	3.80×10^{9}	3.78×10^{9}	2.0×10^{6}	2.20×10^{7}

Hatter Creek Load Analysis

Samples collected from the upper (PR13) and lower (PR12) monitoring sites during the 2002 monitoring season revealed ten instantaneous exceedances of the state secondary contact standard for bacteria. These exceedances occurred during the months of December, March, May, June, July, and August.

The mass per unit volumes for the current load, load capacity, load reduction amount, and percentages were calculated based on the discharge data for each exceedance. An MOS of 10% was applied to the load reduction to ensure the goals of the bacteria TMDL are met.

Until bacteria levels are within state water quality standards, DEQ recommends no AUMs over the current allotment amount be allowed in the watershed. Table 5-7 displays the bi-weekly monitoring results for bacteria; Table 5-8 displays the current load, load allocations, and load reductions.

Table 5-7. Hatter Creek bacteria bi-weekly monitoring results.

Date	PR-12 (E-coli)[1]	PR-13 (E-coli)[1]	PR-12 (discharge)[2]	PR-13 (discharge)[2]
11/26/2001	94	28	3.0986	2.7976
12/5/2001	690	23	2.6914	2.9981
12/19/2001	120	46	5.5202	10.156
1/2/2002	49	28	3.5889	3.5733
1/16/2002	66	20	15.905	19.215
1/29/2002	38	10	32.0286	23.4525
2/12/2002	96	24	17.4595	16.7424
2/26/2002	60	19	64.30035	51.1126
3/12/2002	2400	2400	63.54815	56.1715
3/26/2002	310	73	105.872	63.0497
4/22/2002	74	10	50.8434	42.25325
5/7/2002	50	12	34.464	29.07615
5/22/2002	1100	28	37.2967	37.1462
6/4/2002	100	40	17.9404	15.5809
6/18/2002	690	460	7.06365	7.52475
7/3/2002	420	270	3.8408	4.02485
7/16/2002	650	980	1.3881	2.3304
7/29/2002	1000	690	0.5935	1.4368
8/18/2002	730	190	0.0858	0.93575
8/28/2002	200	0	0.1755	0.5451
9/5/2002	33	140	0.0124	0.6269
9/24/2002	34	180	0.245175	0.5986
10/7/2002	180	170	0.42465	0.562
10/22/2002	12	55	0.3372	0.74795
11/18/2002	370	28	2.0538	1.2122

[1] E-coli Organisms per 100/ml
[2] Cubic feet per second (cfs)

Table 5-8. Bacteria nonpoint sources load allocations for Hatter Creek.

Source	Month	Current Load (*E.coli* organisms/day)	Load Allocation (*E.coli* organisms/day)	MOS (10%)	Load Reduction (*E.coli* organisms/day)
Unknown (PR12)	Dec	4.54×10^{10}	3.79×10^{10}	7.50×10^{8}	8.25×10^{9}
Unknown (PR12)	Mar	3.72×10^{12}	8.93×10^{11}	2.83×10^{11}	3.11×10^{12}
Unknown (PR13)	Mar	3.29×10^{12}	7.89×10^{11}	2.5×10^{11}	2.75×10^{12}
Unknown (PR12)	May	1.00×10^{12}	5.25×10^{11}	4.75×10^{10}	5.23×10^{11}
Unknown (PR12)	Jun	1.19×10^{11}	9.96×10^{10}	1.94×10^{9}	2.13×10^{10}
Unknown (PR12)	Jul	2.21×10^{10}	1.96×10^{10}	2.5×10^{8}	2.75×10^{10}
Unknown (PR13)	Jul	5.59×10^{10}	3.28×10^{10}	2.31×10^{9}	2.54×10^{10}
Unknown (PR12)	Jul	1.45×10^{10}	8.35×10^{9}	6.15×10^{8}	6.77×10^{9}
Unknown (PR13)	Jul	2.43×10^{10}	2.03×10^{10}	4.0×10^{8}	4.4×10^{9}
Unknown (PR12)	Aug	1.53×10^{9}	1.21×10^{9}	3.2×10^{7}	3.52×10^{8}

Rock Creek Load Analysis

Samples collected from both upper (PR15) and lower (PR14) monitoring sites during the 2002 monitoring season revealed two instantaneous exceedances of the state secondary contact standard for bacteria. These exceedances occurred during December and March.

Rock Creek is an intermittent stream; therefore, bacteria TMDLs were only written when discharges were greater than 5 cfs. The mass per unit volumes for the current load, load capacity, load reduction amount, and percentages were calculated based on the discharge data for each exceedance. An MOS of 10% was applied to the load reduction to ensure the goals of the bacteria TMDL are met.

Until bacteria levels are within state water quality standards, DEQ recommends no AUMs over the current allotment amount be allowed in the watershed. Table 5-9 displays the bi-weekly monitoring results for bacteria; Table 5-10 displays the current load, load allocations, and load reductions.

Table 5-9. Rock Creek bacteria bi-weekly monitoring results.

Date	PR-14 (E-coli)[1]	PR-15 (E-coli)[1]	PR-14 (discharge)[2]	PR-15 (discharge)[2]
11/26/2001	59	81	0.39775	0.1302
12/5/2001	96	91	1.1429	0.1662
12/19/2001	610	210	6.09075	1.61325
1/2/2002	150	330	0.6228	0.1788
1/16/2002	74	100	4.2712	0.8833
1/29/2002	120	160	10.2939	2.127
2/12/2002	50	55	11.1844	1.5474
2/26/2002	140	190	79.4793	3.9408
3/12/2002	370	280	75.49	12.79365
3/26/2002	110	580	42.24	5.8307
4/22/2002	20	69	2.0422	1.1373
5/7/2002	980	70	0.87415	0.4435
5/21/2002	56	770	0.4686	0.2012
6/4/2002	36	140	0.203625	0.1197
6/18/2002	99	68	0.068	0.058
7/3/2002	550	140	0.052275	0.091
7/16/2002	0	56	0	0.0699
10/22/2002	4	0	0.13805	0.0966
11/5/2002	4	25	0.0559	0.0523
11/18/2002	3	9	0.1396	0.4115

[1] E-coli Organisms per 100/ml
[2] Cubic feet per second (cfs)

Table 5-10. Bacteria nonpoint sources load allocations for Rock Creek.

Source	Month	Current Load (*E.coli* organisms/day)	Load Allocation (*E.coli* organisms/day)	MOS (10%)	Load Reduction (*E.coli* organisms/day)
Unknown (PR14)	Dec	8.91×10^{10}	8.41×10^{10}	5.0×10^{8}	5.5×10^{9}
Unknown (PR15)	Mar	8.29×10^{10}	8.24×10^{10}	5.0×10^{7}	5.5×10^{8}

Margin of Safety

A ten- percent margin of safety was used in this report for the bacteria TMDLs.

Seasonal Variation

Each 303(d)-listed stream has a different seasonal variation for bacteria exceedances , as shown in the load analyses. Since harmful bacteria have a relatively short life span, it made sense to specify the month for load reductions. Bacteria, unlike sediment, does not stay in a stream network for weeks, months or years; it stays within a stream network for about a day and then dies.

Estimates of Background Bacteria Loading

Regulations allow that “loadings “…may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading,” (Water quality planning and management, 40 CFR 130.2(I)). There are no point sources within the 303(d) watersheds assessed within this report. Harmful bacteria that occur naturally within these streams are minimal; therefore, no estimate of background was attempted.

Time Frame

The goal of this TMDL is to reduce the bacteria loads by the load reduction amount for the waterbodies identified in Tables 5-2, 5-4, 5-6, 5-8, and 5-10. An implementation plan will be completed within 18 months of EPA approval of this TMDL document. Specific actions to comply with this TMDL will be identified within that implementation plan.

5.2 Temperature TMDLs

In-stream Water Quality Targets for Temperature

The temperature targets, in addition to water quality standards for temperature, are based on riparian plant cover over the stream. In this TMDL, *potential natural vegetation* cover (PNV) represents the minimum heat load. Existing vegetative cover represents existing loads of heat to the streams. Those segments with the largest differential between PNV and existing cover (existing cover less than potential cover) are assumed to cause the most heating.

This analysis contains an implicit margin of safety, as all streams are assumed to be at maximum PNV at loading capacity, when in reality natural cover can be more variable due to natural forces (fire, wind throw, drought).

Temperature Load Analysis Techniques

Analysis of temperature loads requires assessments of potential natural riparian vegetation and potential natural aerial cover for the subbasin.

Potential Natural Riparian Vegetation

The natural vegetation of the upper Palouse River region in Latah County, Idaho can best be described as “bunchgrass-dominated steppe (i.e. grassland) of the Palouse Prairie meets the conifer forest.” Early botanist and explorer to the region, Charles Geyer (1846), described the higher elevation grasslands of the Palouse region as bunchgrass prairie bordered by “spacious, open, grassy woods” of large widely spaced Ponderosa pine in “elegant parks” dotted with seasonally wet “spongy meadows” or “gamass” (camas) (Weddell 2000). Later, I.I. Stevens, while performing railroad surveys for the Army in 1853-1855, wrote that the Palouse region was “very fertile rolling country,” “a most beautiful prairie country, the whole of it adapted to agriculture,” “rolling table-land,” “comparable to that of the prairie of Illinois” (Weddell 2000). Stevens indicated that the bottomland of the Palouse “has great resources,” “it is heavily timbered with pine, but with very little underbrush” (Weddell 2000). Both of these explorers captured two very important images of the Palouse River region: the prairie steppe was extensively dominated by bunchgrasses, and valley bottoms and stream corridors may have been in open timber.

Rexford Daubenmire, one of the West’s best-known plant ecologists, worked on explaining forest types for this region. His forest classification for northern Idaho and adjacent Washington (Daubenmire 1952) showed fescue grassland meeting forest in western Latah County. Weaver (1917) on the other hand, showed the entire Palouse River region east of the Idaho-Washington border as coniferous woodland (see *Figure 1* of Weaver 1917). Idaho fescue (*Festuca idahoensis*) /snowberry (*Symphoricarpus albus*) association (Franklin and Dryness 1973) probably dominated western Latah County, near the Idaho-Washington border. How far up the Palouse River this vegetation type existed is perhaps debatable; most authors suggest it occurred as far as Potlatch, or even beyond, according to maps in Black et al. (1998). Fescue grasslands also dominated most of the South Fork Palouse River and Cow Creek areas. This fescue/low shrub grassland met up with lower elevation Ponderosa pine (*Pinus ponderosa*) forest in an open, parkland setting described by the early explorers.

Daubenmire (1952) described forest habitat types that vary with elevation and other factors, such as soil type, moisture and aspect. He described several predominant zones of vegetation that follow roughly a moisture/elevation gradient. The Ponderosa pine zone occupies the lowest and driest zone, then, as one continues up the elevational/moisture gradient, comes the

Douglas fir (*Psuedotsuga menziesii*) zone, followed by the western redcedar (*Thuja plicata*)/ western hemlock (*Tsuga heterophylla*) zone, and finally the Engelmann spruce (*Picea engelmanni*)/subalpine fir (*Abies lasiocarpa*) zone. Franklin and Dryness (1973), in describing the forest zones of eastern Oregon and Washington, list seven forest zones with increasing elevation and moisture. Their list begins with western juniper forests not found in Idaho's Latah County, then includes Ponderosa pine zone, lodgepole pine (*Pinus contorta*) zone, Douglas fir zone, grand fir (*Abies grandis*) zone, western hemlock zone (with western redcedar), and finally the subalpine fir zone at the top. Black et al. (1998) described forest communities of the Palouse region on higher elevation mountain and ridges with warmer sites occupied by Ponderosa pine and Douglas fir with a rich understory of oceanspray (*Holodiscus discolor*), ninebark (*Physocarpus malvaceus*), serviceberry (*Amelanchier alnifolia*), snowberry and rose (*Rosa sp.*) shrubs. On cooler northwest-facing canyons, western redcedar, grand fir, and western larch (*Larix occidentalis*) are supported.

In eastern Washington and presumably adjacent western Idaho, Ponderosa pine stands first appear within the matrix of steppe vegetation and increase in extent in areas until steppe or shrub-steppe vegetation is reduced to mere islands in a matrix of Ponderosa pine forest (Franklin and Dryness 1973). Also, groves of aspen occur on riparian and poorly drained wet areas throughout the Ponderosa pine zone and adjacent forest/steppe zones as well (Franklin and Dyrness 1973).

The native vegetation on the grasslands of the Palouse region is largely gone. Most of these lands have long since been converted to agriculture cropland, hay, and pastureland. Very few remnants of the native Palouse Prairie vegetation survive. However, it is generally recognized that these grasslands were dominated by perennial bunchgrasses, either bluebunch wheatgrass (*Psuedoregneria spicata*) as the dominant in drier portions, or Idaho fescue dominant in more moist parts of the prairie (Black et al. 1998, Weddell 2000, 2001). In western Latah County, covering much of the landscape from the border with Washington to east of Moscow and Potlatch, the Palouse prairie was probably dominated by the Idaho fescue/snowberry zone of Franklin and Dryness (1973). This zone is described as the moistest of the steppe zones with a mosaic of herbaceous and woody species. Grasses included Idaho fescue, bluebunch wheatgrass, and prairie junegrass (*Koeleria cristata*), and shrubs included low growth forms of snowberry, Wood's rose (*Rosa woodsii*) and Nootka rose (*Rosa nutkana*).

While much has been written about forest types in this region (Daubenmire 1952, Franklin and Dryness 1973), and about the historic steppe and shrub-steppe vegetation of the Palouse Prairie (Black et al. 1998, Weddell 2000, and Weddell 2001), little has been written to describe the vegetation in riparian areas of this region.

Weaver (1917) included wet meadow and floodplain forest types in his "hydrosere" classification system. He described dense thickets of trees and shrubs along streams. Larger streams that cut canyons into the basalt had narrow riparian forests, while smaller streams that were intermittent did not cut canyons and, thus, were exposed to the wind, resulting in no woody vegetation in the riparian area. Weaver described small groves of poplars where aspens or even black cottonwoods were dominant. But, by far the major riparian community type was one containing a mixture of alders, hawthorns, willows, serviceberry, and chokecherry. In some cases, alders were the dominant life form; in others, dense thickets of pure hawthorn and serviceberry became dominant. Weaver (1917) described wet meadows in both the mountains and in the prairie. He listed a variety of wet meadow “types,” including tufted hairgrass meadows, sometimes as pure stands, and others, such as camas and cow parsnip dominated meadows.

Within the fescue/snowberry zone moist draws were dominated by black hawthorn (*Crataegus douglasii*) (Black et al. 1998, Franklin and Dyrness 1973, Weaver 1917). In fact, Franklin and Dyrness (1973) describe two plant associations in these wet draws, a hawthorn/snowberry association and a hawthorn/cow-parsnip (*Heracleum lanatum*) association. These draws are dominated by 5 to 7 meter tall hawthorn and may include other shrubs, such as shiny-leaf spirea (*Spiraea betulifolia*), Columbia hawthorn (*Crataegus columbiana*), chokecherry (*Prunus virginiana*), and serviceberry (*Amelanchier alnifolia*). Aspens (*Populus tremuloides*) occurred in phases in these hawthorn associations. Because aspen is short lived, aspen suckers would grow up through the hawthorns, dominate for several years, and then die back, allowing hawthorns to predominate (Franklin and Dyrness 1973).

There were two related riparian types briefly described by Daubenmire. They included a black cottonwood (*Populus trichocarpa*)/water-hemlock (*Cicuta douglasii*) association, which replaces hawthorn/cow-parsnip in drier portions of the steppe, and a white alder (*Alnus rhombifolia*) forest, occurring in some riparian habitats, sometimes in association with black cottonwood (Franklin and Dryness 1973). Black et al. (1998) indicated that true riparian communities were largely limited to the Palouse and Potlatch Rivers. These communities formed a narrow gallery forest of plains cottonwood (*Populus deltoides*), aspens, mountain maple (*Acer glabrum*), and red alder (*Alnus rubra*).

There may have been some confusion on exact species over the years; however, the information clearly demonstrates that riparian areas, whether they were merely moist draws or river gallery forest, were dominated by tall shrubs and trees: hawthorns, aspens, cottonwoods, and alders. In terms of vegetation height, hawthorns and aspens are relatively small trees (3-12m), alders are of intermediate heights (10-25m), and cottonwoods can be very tall (25-30m). We anticipate vegetative cover over a small (<5m wide) stream to vary from about 60-80% for mature hawthorn or aspen dominated communities, to about 70-100% cover for mature alder and cottonwood dominated communities.

Potential Natural Aerial Cover

The amount of aerial cover over a stream is a function of stream width (bankfull), the type of vegetation in the riparian community (whether it is trees, shrubs, or grasses or it’s height and width), and the density or condition of plants in the riparian community. All streams in this TMDL (Deep, Gold, Big, Flannigan, and Hatter Creeks) are less than 5 meters wide. A very dense plant community with plants that have large lateral spread (conifers, for example, can have overhangs of three meters) can provide 100% cover on a small stream. Based on our experience with mapping aerial cover on streams in forested regions of Idaho, typical aerial cover for small streams (less than five meters wide) in forested regions can vary from 70 to 100% depending on the density of the trees in the riparian zone. Drier, more open pine/grass communities are on the low end of that scale while wetter spruce/fir communities can have 100% aerial cover on a small stream. Cottonwood, aspen, alder, and hawthorn riparian communities can be more open than conifer dominated systems and may have a wider array of cover values (60-100%).

Shrub (or small tree) dominated riparian communities have lesser cover because of their smaller stature. Shrub dominated, mature riparian communities in southern Idaho have aerial cover as high as 65% (Shumar 2003). We anticipate that typical shrub aerial cover on a small 5-meter wide stream in northern Idaho will vary from 40 to 80%, depending on the species present. Large shrubs or small trees, such as water birch, alders, hawthorn, and aspen can have overhangs up to 2 meters, providing significant stream cover up to 80%. Smaller shrubs (willows, serviceberry, rose, bramble, and snowberry) may have lesser amounts of cover.

Grass dominated riparian areas along stream courses are not common. Usually, because of significant moisture supply, woody vegetation predominates these areas. However, grass dominated riparian areas can persist at high elevation mountain meadows and where camas wetlands existed. Large grasses, such as tufted hairgrass and giant wildrye, probably provided significant cover (up to 40%) over 5-meter wide streams. Many grass-dominated meadows develop highly braided stream systems, where each individual braid may be deep and narrow with significant bank overhang. Such natural systems may have provided even greater cover.

As stream widths increase, aerial cover provided by riparian vegetation decreases. Based on potential overhang of branches and plant material, a tree dominated riparian community can provide 100% cover on a stream up to 6 meters wide at bankfull (3-meter overhang). For shrub dominated communities (2 meter overhang), a 4-meter wide stream may experience 100% cover. And a stream 2-meter wide stream may receive 100% cover from grasses (1-meter overhang).

Palouse Region Potential Cover based on Soils

In addition to historical records and work of scientists in plant classification schemes for the region, potential natural vegetation was also described by soil scientists in county soil surveys. We mapped the soils associated with narrow riparian corridors for the eight streams in question from the Latah County Soil Survey (Barker 1981). Table 5-11 shows those soils, in order of their map unit number in the survey, not necessarily their distribution on the ground. Lower number units (7-28) tend to be restricted to narrow bands along streams. Higher number soil units (31-64, but not 65) tend to cover large headwater areas of forest and are not restricted to riparian corridors. Soil unit 65 appears to be related to larger river floodplain soils.

Following Table 5-11 is a list of the vegetation types (forest and non-forest) associated with the soils found along streams in Latah County.

Table 5-11. Soil units and associated potential natural vegetation description for soils found along streams in Latah County (Barker 1981).

Soil Unit Number	Name and % slope	PNV Cover	Potential Natural Vegetation (PNV)
5	Bluesprin-Flybow 35-65	50%	Mainly grasses
7	Crumarine silt loam 0-3%	70%	Grasses, shrubs, and a few conifers
9	Farber/Minaloosa assoc., very steep	70%	Mainly coniferous trees (Doug fir, Ponderosa pine)
11	Hampson silt loam 0-3%	50%	Grasses, shrubs, and a few trees
18	Joel silt loam 35-60%	70%	Mainly coniferous trees (Doug fir, Ponderosa pine)
25	Latah silt loam 0-3%	50%	Mainly grasses and shrubs
26	Latahco silt loam 0-3%	70%	Mainly coniferous trees (Ponderosa pine)
27	Latahco-Lovell silt loam 0-3%	70%	Mainly coniferous trees (Ponderosa pine)
28	Latahco/Thutuna silt loam 0-3%	70%	Mainly grasses and coniferous trees (Ponderosa pine)
30	Minaloosa loam 35-65%	80%	Mainly coniferous trees (grand fir, Doug fir)
31	Minaloosa-Huckleberry assoc. very deep	80%	Mainly coniferous trees (grand fir, Doug fir, Ponderosa pine)
33	Naff-Palouse silt loam 7-25%	50%	Mainly grasses
35	Palouse silt loam 3-7%	50%	Mainly grasses
37	Palouse/Latahco silt loam 0-3%	70%	Mainly grasses and coniferous trees (Ponderosa pine)
38	Porrett silt loam 0-3%	50%	Tufted hairgrass, sedges, Douglas (black) hawthorn
39	Santa silt loam 2-5%	80%	Mainly coniferous trees (grand fir, Doug fir)
40	Santa silt loam 5-20%	80%	Mainly coniferous trees (grand fir, Doug fir, western white pine)
41	Santa silt loam, 20-35%	80%	Mainly coniferous trees (grand fir, Doug fir)
45	Southwick silt loam 12-25%	70%	Mainly coniferous trees (Ponderosa pine)
48	Spokane loam 15-35%	70%	Mainly coniferous trees (Doug fir, Ponderosa pine)
49	Spokane/rock outcrop 35-65%	70%	Mainly coniferous trees (Doug fir, Ponderosa pine)
50	Taney silt loam 3-7%	70	Mainly coniferous trees (Doug fir, Ponderosa pine)

51	Taney silt loam 7-25%	70%	Mainly coniferous trees (Doug fir, Ponderosa pine)
52	Taney silt loam 25-35%	70%	Mainly coniferous trees (Doug fir, Ponderosa pine)
58	Uvi loam 5-20%	80%	Mainly coniferous trees (grand fir, Doug fir, Ponderosa pine, western larch)
59	Uvi loam 20-35%	80%	Mainly coniferous trees (grand fir, Doug fir, Ponderosa pine, western larch)
60	Uvi/Spokane assoc. very steep	80%	Mainly coniferous trees (grand fir, Doug fir, Ponderosa pine, western larch/ Ponderosa pine, Doug fir)
61	Uvi/Vassar assoc. very deep	90%	Mainly coniferous trees (grand fir, Doug fir, Ponderosa pine/western white pine, grand fir, western redcedar, Doug fir, western larch)
63	Vassar silt loam 20-35%	90%	Mainly coniferous trees (western white pine, grand fir, western redcedar, Doug fir, western larch)
64	Vassar silt loam 35-65%	90%	Mainly coniferous trees (western white pine, grand fir, western redcedar, Doug fir, western larch)
65	Westlake/Latahco silt loam 0-3%	50%	Mainly grasses

Riparian Forest Types based on Latah County Soil Survey

Ponderosa Pine/Grassland/Parkland

Soils: 7, 28, 37, 45, 26, 27

grasses ⟷ trees

The Ponderosa pine grassland/parkland type occurred on a number of lower elevation, valley bottom soils. The density of trees varied with soil type from a few trees on Crumarine silt loam, 0-3% slope (7) to mainly coniferous tree dominated on Latahco-Lovell silt loam, 0-3% slope (27) (Barker 1981). It is unknown to what extent deciduous shrubs and trees (hawthorns, aspens, cottonwoods, alders) played a part in the streamside plant community. We estimate canopy cover to be about 70% on a 5-meter wide stream based on the presence of open Ponderosa pine canopy.

Ponderosa pine/Douglas fir

Soils: 9, 18, 48, 49, 50, 51, 52

The Ponderosa pine/Douglas fir type occurred on four soil groups (Joel, Spokane, Taney, and Farber/Minaloosa association) mapped in this exercise. The understory potential for Joel, Spokane and Taney soils included bluebunch wheatgrass, Idaho fescue, pine reedgrass (*Calamagrostis rubescens*), mallow ninebark (*Physocarpus malvaceus*) and/or snowberry (Barker 1981). The Farber/Minaloosa association has a mallow ninebark and creambush oceanspray (*Holodiscus discolor*) understory. These soils are described as having natural vegetation that is mainly coniferous trees. Because of the presence of coniferous forest, regardless of what streamside vegetation there was, aerial cover was likely to be at least as high as 70% on a 5-meter wide stream, and probably higher.

Grand fir/Douglas fir

Soils: 30, 31, 39, 40, 41, 58, 59, 60

The soils where grand fir and Douglas fir predominate include Minaloosa, Minaloosa/Huckleberry association, Santa, and Uvi. These mountainside soils are well suited for the production of timber. Western redcedar may occur on more moist northwest facing slopes and drier south facing slopes may contain some Ponderosa pine. Because these soils were largely dominated by coniferous forests, potential natural cover was likely in excess of 80%.

Western White pine/Grand fir/Western Redcedar

Soils: 61, 63, 64

Vassar soils have potential natural vegetation that was dominated by western redcedar, western white pine, pachystima, and mountain blueberry. These soils are steep mountainsides at the tops of drainages. Small, first-order streams that emanate from these mountains were probably completely covered (90-100%) with vegetation.

Non-forest Riparian Types

Grass dominated lands

Soils: 5, 11, 25, 33, 35, 65

Soils in valley bottoms along the Palouse River (Hampson), the South Fork Palouse River (Westlake/Latahco), and Cow Creek are described in the Latah County Soil Survey (Barker 1981) as being mainly grassland soils. The Bluesprin-Flybow soil complex is in Idaho fescue/snowberry vegetation on south-facing canyon hillsides. No evidence is given on what the streamside vegetation may have been. It seems logical that these low elevation areas would harbor the fescue/snowberry habitat type of the Palouse steppe region. However, the stream and river corridors themselves probably had cottonwood, maples, alders, and hawthorns as described by Black et al. (1998). In addition to the two larger rivers, lower Deep Creek soils are essentially dominated by Hampson silt loam (11). The riparian area along Deep Creek may have been too small or intermittent to support woody vegetation, but might have been dominated by the smaller riparian species, such as tufted hairgrass or cow-parsnip. The Bluesprin-Flybow complex occurs in one small location in the Crane Creek watershed in this analysis. On a small stream (5 meters wide), we anticipate that cover may have been highly variable (30-70%). Therefore, we have selected an average cover of 50% to reflect the low cover potential of shrub and grass dominated riparian areas.

Black hawthorn/tufted hairgrass (*Deschampsia cespitosa*)

Soils: 38

The Porrett soil type occurs on valley floors and has a potential natural vegetation of mainly tufted hairgrass, sedges (*Carex sp.*), and black hawthorn (Barker 1981). Porrett soils dominate the middle portions of Flannigan Creek and Rock Creek. It is possible that portions of these streams may have had tufted hairgrass meadow vegetation in the riparian area, which provides substantially less cover than hawthorn thickets, especially for streams wider than 2 meters. For grass dominated riparian areas, we have selected an aerial cover of 30-40% on a 5-meter wide stream. Otherwise, cover in hawthorn dominated riparian communities can be as high as 70%. Therefore, we have selected an average cover of 50% to reflect the low cover potential of shrub and grass dominated riparian areas. This analysis suggests that there will likely be more incompatibility between existing cover and potential cover on this soil type. Areas that are hawthorn dominated will have cover greater than this average of 50%. Where that occurs, potential natural cover is likely to be closer to 70%. Likewise, grass dominated areas are likely to have potential cover less than 50%. Thus, the over-estimation and the under-estimation balance each other out.

Aerial Photo Interpretation

Existing cover on 1:100K hydrography streams in each watershed (Deep, Gold, Big, Flannigan, Rock, and Hatter Creeks) was visually estimated from aerial photographs taken in 1998 and displayed at terraserver-usa.com. Photographs were observed at one-meter resolution.

Streams were divided into segments based on natural changes in their riparian cover. Each segment received a single value representing a cover class of 10% (see Appendix E for results). Cover classes ranged from 0% (0-9% cover) to 90% (90-100% cover) in 10% intervals. In general, coniferous forest riparian areas were in cover classes from 70% to 90%. Large shrub/small deciduous tree cover classes ranged from 50% to 70%, and small shrub and grass riparian areas could have cover classes from 10% to 50%. The cover class for any one segment depended on vegetation type and density of cover.

In addition to existing cover, soil map units were recorded for all streams seen at 1:100K hydrography. Corresponding potential natural cover for each map unit from the discussion above was used to compare existing cover to potential cover (see Appendix E for results). In some cases, especially on any National Forest areas, soil units were not mapped in the Latah County Soil Survey (Barker 1981). In such cases, the soil unit was estimated based on neighboring mapped watersheds.

Load Capacity

As described above, the Load Capacity for temperature TMDLs on Deep, Gold, Big, Flannigan, Rock, and Hatter Creeks in the Palouse River subbasin is based on potential natural vegetation cover over the streams. Thus, potential cover as a percentage represents the heat loading permitted to achieve water quality standards and maximum possible heat reduction.

Descriptions of potential natural vegetation are based on literature research and best professional judgment about how much cover a given vegetation type will provide. These estimates are not exact. Additionally, existing cover is based on aerial photo interpretation, which also has its limitations on accuracy. Estimated differences between existing and potential cover within a range of 20% are within the range of sampling variability in our opinion. Therefore, we have described the cover differences in terms of a condition class rating from *Very Good* cover to *Poor* cover:

- Those stream locations that have existing and potential cover differences between zero and any positive value have *Very Good* cover, which we would expect to duplicate potential natural vegetation.
- Cover differences between 0.1% and –20% may be slightly affected but are still within the sampling variability to be considered in *Good* condition in our estimation.
- Cover differences between –20.1% and –40% result from vegetation that has been affected by perturbation and are in *Fair* condition.
- Cover differences more substantial than –40% are in *Poor* condition.

Stream reaches in *Fair* or *Poor* condition lack obvious cover and are potentially detrimental to stream temperature. These two condition classes are the center of attention in this TMDL and will require load reductions to improve temperature conditions.

Estimates of Existing Pollutant Loads

Regulations allow that loadings "...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading," (Water quality planning and management, 40 CFR 130.2(I)). An estimate must be made for each point source. Nonpoint sources are typically estimated based on the type of sources (land use) and area (such as a subwatershed), but may be aggregated by type of source or land area. To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads.

As described above in *Temperature Load Allocation Techniques* (page 139), existing loads are based on existing aerial cover from riparian vegetation visually estimated from aerial photographs. Existing cover represents the current heat loading to the streams; the least cover causes the most heat loading. To our knowledge, there are no point sources of heat in these watersheds. Thus, there are no WLAs in this temperature TMDL.

Tables 5-12 through 5-16 show loads from nonpoint sources for the affected watersheds.

Table 5-12. Loads from nonpoint sources in Flannigan Creek Watershed.

Stream Segment	Average Existing Cover (Existing Load)	Estimation Method
Lower Flannigan (AU #ID17060108CL011b_03)	43%	Aerial Photo Interpretation
Upper Flannigan (AU #ID17060108CL011a_03)	58.3%	Aerial Photo Interpretation
Tributary to Lower Flannigan (AU #ID17060108CL011b_02)	35.7%	Aerial Photo Interpretation
Tributary to Upper Flannigan (AU #ID17060108CL011a_02)	73.3%	Aerial Photo Interpretation
Tributary to Upper Flannigan (AU #ID17060108CL011a_02)	78%	Aerial Photo Interpretation
Tributary to Upper Flannigan (AU #ID17060108CL011a_02)	70%	Aerial Photo Interpretation
West Fork Flannigan (AU #ID17060108CL011a_02)	62.2%	Aerial Photo Interpretation
Tributary to WF Flannigan (AU #ID17060108CL011a_02)	75%	Aerial Photo Interpretation
Tributary to WF Flannigan (AU #ID17060108CL011a_02)	75%	Aerial Photo Interpretation

Table 5-13. Loads from nonpoint sources in Hatter Creek Watershed.

Stream Segment	Average Existing Cover (Load)	Estimation Method
Lower Hatter (AU #ID17060108CL015b_03)	38.7%	Aerial Photo Interpretation
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	47%	Aerial Photo Interpretation
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	59.2%	Aerial Photo Interpretation
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	58.6%	Aerial Photo Interpretation
Tributary Complex to Lower Hatter (AU#ID17060108 CL015b_02)	64.5%	Aerial Photo Interpretation
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	58.6%	Aerial Photo Interpretation
Upper Hatter and Tributaries (AU #ID17060108CL015a_02)	72.5%	Aerial Photo Interpretation
Long Creek (AU #ID17060108CL015a_02)	68.6%	Aerial Photo Interpretation

Table 5-14. Loads from nonpoint sources in Gold Creek Watershed.

Stream Segment	Average Existing Cover (Load)	Estimation Method
Lower Gold & Lowest Tributary (AU #ID17060108CL029_03)	23.3%	Aerial Photo Interpretation
Upper Gold (AU #ID17060108CL030_02)	63.1%	Aerial Photo Interpretation
Nelson Creek (AU #ID17060108CL030_02)	70%	Aerial Photo Interpretation
Tributary to Upper Gold (AU #ID17060108CL030_02)	66%	Aerial Photo Interpretation
Waterhole Creek (AU #ID17060108CL030_02)	75%	Aerial Photo Interpretation
Tributary to Upper Gold (AU #ID17060108CL030_02)	75%	Aerial Photo Interpretation
Tributaries to Upper Gold (AU #ID17060108CL030_02)	83.3%	Aerial Photo Interpretation
Lower Crane Creek (AU #ID17060108CL031b_02)	55%	Aerial Photo Interpretation
Tributaries to Lower Crane (AU #17060108CL031b_02)	31.3%	Aerial Photo Interpretation
Upper Crane Creek (AU #ID17060108CL031a_02)	72%	Aerial Photo Interpretation

Table 5-15. Loads from nonpoint sources in Big Creek Watershed.

Stream Segment	Average Existing Cover (Load)	Estimation Method
Lower Big Creek (AU #ID17060108CL027b_02)	56.7%	Aerial Photo Interpretation
Lost Creek (AU #ID17060108CL027b_02)	63.3%	Aerial Photo Interpretation
Last Chance Creek (AU #ID17060108CL027b_02)	80%	Aerial Photo Interpretation
Tributaries to Lower Big (AU #ID17060108CL027b_02)	61.7%	Aerial Photo Interpretation
Upper Big Creek (AU #ID17060108CL027a_02)	80%	Aerial Photo Interpretation
Tributaries to Upper Big (AU #ID17060108CL027a_02)	73.8%	Aerial Photo Interpretation

Table 5-16. Loads from nonpoint sources in Deep Creek Watershed.

Stream Segment	Average Existing Cover (Load)	Estimation Method
Lower Deep Creek (AU #ID17060108CL032b_03)	15.6%	Aerial Photo Interpretation
Tributaries to Lower Deep (AU #ID17060108CL032b_02)	21.2%	Aerial Photo Interpretation
Upper Deep Creek (AU #ID17060108CL032a_03)	25%	Aerial Photo Interpretation
East Fork Deep Creek (AU #ID17060108CL032a_02)	47.7%	Aerial Photo Interpretation
Middle Fork Deep & Tribs (AU #ID17060108CL032a_02)	54%	Aerial Photo Interpretation
West Fork Deep & Trib (AU #ID17060108CL032a_02)	62.9%	Aerial Photo Interpretation
Tributary to Upper Deep (AU #ID17060108CL032a_02)	43.3%	Aerial Photo Interpretation

Load Allocation

Each stream segment has many cover estimations, both existing and potential, occurring at natural breaks in the vegetation or soils (see Appendix E). These estimations have been averaged for each segment for presentation here. Thus, a single existing cover value for a segment in the load allocation tables below represents an average existing cover value for the entire stream segment. Some of these segments have areas of poor cover and areas of good cover, which tends to ameliorate the size of the average cover somewhat. However, heat load on the stream is an integration of the stream's entire cover, and some areas may provide refuge from direct solar radiation while other areas do not.

Load allocations are based on the average cover deficiency experienced by each creek segment. In this case, cover deficiency is defined as the average existing cover minus the average potential natural cover (PNV) divided by PNV, and then converted to a percentage by multiplying by 100. In this fashion, segments with average existing cover less than average PNV will show up as a negative percent cover. Those segments with zero deficiency or positive percentage values are meeting their PNV.

A negative percent load allocation means that the average cover on the stream segment needs to increase by that amount in order to come into compliance with water quality standards. It is assumed that meeting PNV will result in maximum possible shading or minimum possible heat load, and will result in stream temperatures equivalent to appropriate criteria.

As stated previously, those cover differences of –20% or less are in cover condition classes of *Good* and *Very Good* and do not require load reductions.

We have not included a load allocation for those streams in the following load allocation tables. However, actual differences can be viewed for individual segments in the tables in the Appendix. Those cover differences more negative than –20% are in 'Fair' to 'Poor' condition and will require load reductions consistent with the magnitude of their deficiency.

Margin of Safety

A margin of safety is considered implicit in the design of the loading capacity. The PNV is considered the maximum amount of shading that is possible and does not take into account that natural cover often varies as the result of resource partitioning, fire and other natural forces, and drought.

Seasonal Variation

Stream cover is usually highest when air temperatures are highest. Because much of the riparian vegetation is deciduous, it reaches maximum cover in the summer when air temperatures are at their highest. In coniferous forested reaches, cover persists year-round; however, there is still considerable deciduous vegetation in the riparian area under the forest canopy which makes these areas high in cover. Although cover is lower at other times of the year, there usually is not a problem with stream temperatures during these times.

Background

There are no additional background loads to be considered. Background is considered implicit in both the PNV (which essentially is background) and water quality standards.

Reserve

There is no reserve capacity. Streams need to attain PNV to achieve water quality standards. In stream segments that are meeting PNV, no reduction in cover should be allowed.

Table 5-17. Load nonpoint source allocations for Flannigan Creek Watershed.

Segment	Average PNV (Load Capacity)	Average Existing Cover (Existing Load)	Average Cover Condition Class	Average Load Allocation #
Lower Flannigan (AU #ID17060108CL011b_03)	68%	43%	Fair	-36.3%
Upper Flannigan (AU #ID17060108CL011a_03)	56.7%	58.3%	Very Good	See Appendix for stream segment analysis
Tributary to Lower Flannigan (AU#ID17060108CL011b_02)	70%	35.7%	Poor	-49%
Tributary to Upper Flannigan (AU#ID17060108CL011a_02)	76.7%	73.3%	Good	See Appendix for stream segment analysis
Tributary to Upper Flannigan (AU#ID17060108CL011a_02)	76%	78%	Very Good	See Appendix for stream segment analysis
Tributary to Upper Flannigan (AU#ID17060108CL011a_02)	76.7%	70%	Good	See Appendix for stream segment analysis
West Fork Flannigan (AU #ID17060CL011a_02)	62.2%	62.2%	Very Good	See Appendix for stream segment analysis
Tributary to WF Flannigan (AU#ID17060108CL011a_02)	80%	75%	Good	See Appendix for stream segment analysis
Tributary to WF Flannigan (AU#ID17060108CL011a_02)	87.5%	75%	Good	See Appendix for stream segment analysis

LA= ((Existing cover – Potential cover)/Potential cover) x 100. All *Very Good* and *Good* cover condition classes meet potential natural vegetation within limits of variability. See Appendix E for specific stream segments that may or may not meet these conditions.

Table 5-18. Load nonpoint source allocations for Hatter Creek Watershed.

Segment	Average PNV (Load Capacity)	Average Existing Cover (Existing Load)	Average Cover Condition Class	Average Load Allocation #
Lower Hatter (AU #ID17060108CL015b_03)	63.3%	38.7%	Fair	-37.6%
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	70%	47%	Fair	-35.1%
Tributary to Lower Hatter (AU#ID17060108CL015b_02)	72.3%	59.2%	Good	See Appendix for stream segment analysis
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	78.6%	58.6%	Fair	-25%
Tributary Complex to Lower Hatter (AU#ID17060108 CL015b_02)	77.9%	64.5%	Good	See Appendix for stream segment analysis
Tributary to Lower Hatter (AU #ID17060108CL015b_02)	77.1%	58.6%	Fair	-24%
Upper Hatter and Tributaries (AU#ID17060108CL015a_02)	84.3%	72.5%	Good	See Appendix for stream segment analysis
Long Creek (AU #ID17060108CL015a_02)	85.7%	68.6%	Good	See Appendix for stream segment analysis

LA= ((Existing cover – Potential cover)/Potential cover) x 100. All *Very Good* and *Good* cover condition classes meet potential natural vegetation within limits of variability. See Appendix E for specific stream segments that may or may not meet these conditions.

Table 5-19. Load nonpoint source allocations for Gold Creek Watershed.

Segment	Average PNV (Load Capacity)	Average Existing Cover (Existing Load)	Average Cover Condition Class	Average Load Allocation #
Lower Gold & Lowest Trib (AU #ID17060108CL029_03)	60%	23.3%	Poor	-60.8%
Upper Gold (AU #ID17060108CL030_02)	67.7%	63.1%	Good	See Appendix for stream segment analysis
Nelson Creek (AU #ID17060108CL030_02)	71.1%	70%	Very Good	See Appendix for stream segment analysis
Tributary to Upper Gold (AU #ID17060108CL030_02)	78%	66%	Good	See Appendix for stream segment analysis
Waterhole Creek (AU #ID17060108CL030_02)	75%	75%	Very Good	See Appendix for stream segment analysis
Tributary to Upper Gold (AU #ID17060108CL030_02)	80%	75%	Good	See Appendix for stream segment analysis
Tributaries to Upper Gold (AU #ID17060108CL030_02)	83.3%	83.3%	Very Good	See Appendix for stream segment analysis
Lower Crane Creek (AU #ID17060108CL031b_02)	70%	55%	Fair	-21.5%
Tributaries to Lower Crane (AU #17060108CL031b_02)	70%	31.3%	Poor	-53.2%
Upper Crane Creek (AU #ID17060108CL031a_02)	76%	72%	Good	See Appendix for stream segment analysis

LA= ((Existing cover – Potential cover)/Potential cover) x 100. All *Very Good* and *Good* cover condition classes meet potential natural vegetation within limits of variability. See Appendix E for specific stream segments that may or may not meet these conditions.

Table 5-20. Load nonpoint source allocations for Big Creek Watershed.

Segment	Average PNV (Load Capacity)	Average Existing Cover (Existing Load)	Average Cover Condition Class	Average Load Allocation #
Lower Big Creek (AU #ID17060108CL027b_02)	70%	56.7%	Good	See Appendix for stream segment analysis
Lost Creek (AU #ID17060108CL027b_02)	73.3%	63.3%	Good	See Appendix for stream segment analysis
Last Chance Creek (AU #ID17060108CL027b_02)	80%	80%	Very Good	See Appendix for stream segment analysis
Tributaries to Lower Big (AU #ID17060108CL027b_02)	71.7%	61.7%	Good	See Appendix for stream segment analysis
Upper Big Creek (AU #ID17060108CL027a_02)	80%	80%	Very Good	See Appendix for stream segment analysis
Tributaries to Upper Big (AU #ID17060108CL027a_02)	82.5%	73.8%	Good	See Appendix for stream segment analysis

LA= ((Existing cover – Potential cover)/Potential cover) x 100. All *Very Good* and *Good* cover condition classes meet potential natural vegetation within limits of variability. See Appendix E for specific stream segments that may or may not meet these conditions.

Table 5-21. Load nonpoint source allocations for Deep Creek Watershed.

Segment	Average PNV (Load Capacity)	Average Existing Cover (Existing Load)	Average Cover Condition Class	Average Load Allocation #
Lower Deep Creek (AU #ID17060108CL032b_03)	54.4%	15.6%	Poor	-70.2%
Tributaries to Lower Deep (AU#ID17060108CL032b_02)	65.2%	21.2%	Poor	-69.3%
Upper Deep Creek (AU #ID17060108CL032a_03)	50%	25%	Poor	-50%
East Fork Deep Creek (AU #ID17060108CL032a_02)	68.5%	47.7%	Fair	-30%
Middle Fork Deep & Tribs (AU#ID17060108CL032a_02)	69.5%	54%	Fair	-23.7%
West Fork Deep & Trib (AU #ID17060108CL032a_02)	71.8%	62.9%	Good	See Appendix for stream segment analysis
Tributary to Upper Deep (AU #ID17060108CL032a_02)	68.9%	43.3%	Fair	-37.3%

LA= ((Existing cover – Potential cover)/Potential cover) x 100. All *Very Good* and *Good* cover condition classes meet potential natural vegetation within limits of variability. See Appendix E for specific stream segments that may or may not meet these conditions.

5.3 Nutrient TMDLs

Nutrient TMDLs were developed for the entire watershed of Flannigan Creek, and the lower section of Hatter Creek. The nutrient target is based on a numeric state standard for dissolved oxygen requiring the level to be greater than 6.0 mg/L at all times, and a narrative target stating that surface waters shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses

In-Stream Water Quality Targets for Nutrients

The in-stream water quality target for nutrients was developed to restore full support of designated beneficial uses. The in-stream load reduction amount is based on measured total phosphorus (TP) amounts above the load capacity of 0.1 mg/L TP during the growing season of May through October, and on the measured dissolved oxygen (DO) concentration below the state standard of 6.0 mg/L.

Design Conditions/Target Selection

TMDLs for nutrients, specifically TP, present several challenges, including the fact that relationships between nutrient concentrations and environmental responses are complex and variable. Temperature, pH, flow, nutrient levels, sediment, conductivity, and dissolved oxygen are interrelated parameters. This is compounded by the fact that there is no generally agreed upon framework for evaluating nutrient impacts on streams and rivers. The data supporting the nutrient TMDLs demonstrate a significant consecutive period of elevated TP levels and low DO levels.

Phosphorus is the essential plant nutrient that most often controls aquatic plant (algae and rooted plant) growth. Phosphorus can be soluble or particulate in water. Two forms of phosphorus commonly measured in laboratories include soluble reactive phosphorus, which is dissolved in water, and total phosphorus, which includes both soluble and particulate forms. Unlike nitrogen, there is no atmospheric (vapor) form of phosphorus, and for this reason phosphorus is often a limiting nutrient in aquatic systems. This means that when large amounts of phosphorus enter a lake or stream, plant growth is greatly increased which can create water quality problems. Increased plant growth is coupled with increased decomposition, which depletes dissolved oxygen concentrations.

Dissolved oxygen (DO) refers to the volume of oxygen contained in water. Oxygen enters the water by photosynthesis of aquatic biota and the transfer of oxygen across the air-water interface. The amount of oxygen that can be held by the water depends on water temperature, salinity, and pressure. Gas solubility increases with decreasing temperature (colder water holds more oxygen). Gas solubility increases with decreasing salinity (freshwater holds more oxygen than does saltwater). Both the partial pressure and the degree of saturation of oxygen change with altitude. Finally, gas solubility decreases as pressure decreases. Thus, the amount of oxygen absorbed in water decreases as altitude increases because of the decrease in relative pressure (Smith, 1990).

Once absorbed, oxygen is either incorporated throughout the water body via internal currents or is lost from the system. Flowing water is more likely to have high dissolved oxygen levels than is stagnant water because of the water movement at the air-water interface. In flowing water, oxygen-rich water at the surface is constantly being replaced by water containing less oxygen because of turbulence, creating a greater potential for exchange of oxygen across the air-water interface. Because stagnant water undergoes less internal mixing, the upper layer of oxygen-rich water tends to stay at the surface, resulting in lower dissolved oxygen levels throughout the water column. Oxygen losses readily occur when water temperatures rise, when plants and animals respire, and when microbes aerobically decompose organic matter. Oxygen has a very short retention time in water as its soluble form of PO_4 (phosphate or ortho-phosphate) is readily taken up by plants. Unlike nitrogen, phosphorus does not form any toxic by-products as it recycles through the ecosystem.

For this TMDL, a value 0.1 mg/L total phosphorus (TP) and a dissolved oxygen level of at least 6.0 mg/L were used as the base for the load capacities for these nutrient TMDLs. By maintaining TP levels below 0.1 mg/L and DO levels above 6.0 mg/L during the growing season DEQ believes this will ensure that nuisance algae will not impair beneficial uses. DO is easy to monitor and track for implementation and 6.0mg/L is the state standard, meaning that DO readings below 6.0 mg/L will impair beneficial uses by stressing fish and other aquatic organisms. TP was chosen as a target as TP is also fairly easy to monitor and track for implementation. It is usually in very short supply in aquatic ecosystems and is therefore a limiting nutrient and easier than nitrogen to manage.

Monitoring Points

The monitoring points for TMDL compliance for the nutrient TMDLs are the mouths of each stream; however, beneficial uses must be met throughout each 303(d) watershed. DEQ recommends that the upper monitoring site in Flannigan Creek (PR-17) be an additional compliance point. In most cases the lowest downstream monitoring site is the mouth. In the case of Flannigan Creek and Hatter Creek we were not able to access the actual mouth, but the lowest downstream monitoring sites are within a mile of the mouth. During the planning phase of the monitoring for this TMDL an attempt was made to get a site as close as possible to the mouth.

Nutrient Load Analysis Methodology

The load capacity is the amount of pollutant a water body can receive without violating water quality standards. The load capacity for Flannigan Creek and Hatter Creek is set at a level that fully supports beneficial uses. Seasonal variation, a background amount, and an MOS were all considered to determine the load capacity.

For Flannigan and Hatter Creeks the load capacity (LC) was calculated based on the relationship between background TP, a TP load allocation and a margin of safety represented in the following equation:

$$LC=MS+BK+LA.$$

Where MS = Margin of Safety = (-0.005 mg/L)
BK = Background = 0.035 mg/L
LA = Load Allocation = 0.070 mg/L
LC = Load Capacity = 0.10 mg/L

Background

Regulations allow that "loadings "…may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading," (Water quality planning and management, 40 CFR 130.2(I)). There are no point sources within the 303(d) watersheds assessed within this report. The background TP amount was determined by examining monitoring data from four watershed that have relatively few anthropogenic impacts with similar geologies, soil types and land-uses.

Nutrient data was collected within the following four watersheds, Big Creek, Moose Creek-upper and lower, and the west fork Potlatch River, during 2001 and 2002 as shown in Table 5-22. The yearly TP average of these watershed ranged from 0.0314 to 0.0398 mg/L, with a combined average of 0.035. This is the background value that was used in the TMDL loading calculation. A load allocation of 0.055 mg/L was established for these TMDLs..

Table 5-22. TP monitoring results used for as background.

Dates	Moose lower	Moose upper	WF Potlatch Cr	Big Creek-upper	
				Dates	Value
12/27/2001	0.031	0.035	DNS	11/26/2001	0.047
1/8/2002	0.032	0.031	DNS	12/5/2001	0.036
1/22/2002	0.032	0.023	DNS	12/19/2001	0.057
2/4/2002	0.021	0.019	DNS	1/2/2002	0.047
2/19/2002	0.032	0.025	DNS	1/16/2002	0.043
3/4/2002	0.031	0.029	DNS	1/29/2002	DNS
3/18/2002	0.032	0.028	DNS	2/12/2002	DNS
4/1/2002	0.029	0.021	DNS	2/26/2002	DNS
4/14/2002	0.027	0.021	DNS	3/12/2002	DNS
4/30/2002	0.017	0.012	0.013	3/26/2002	DNS
5/13/2002	0.014	0.013	0.017	4/8/2002	0.1
5/30/2002	0.027	0.029	0.029	4/22/2002	0.042
6/11/2002	0.028	0.031	0.035	5/7/2002	0.036
6/25/2002	0.025	0.042	0.031	5/22/2002	0.051
7/10/2002	0.033	0.05	0.036	6/4/2002	0.044
7/24/2002	0.062	0.081	0.047	6/18/2002	0.067
8/7/2002	0.024	0.042	0.033	7/3/2002	0.044
8/21/2002	0.043	0.046	0.032	7/16/2002	0.042
9/4/2002	0.29	0.046	0.037	7/29/2002	0
9/19/2002	0.093	0.05	0.037	8/18/2002	0
10/3/2002	0.031	0.042	0.036	8/28/2002	0
10/15/2002	0.024	0.041	0.028	9/5/2002	0
10/30/2002	0.023	0.042	0.031	9/24/2002	0.066
11/14/2002	0.019	0.037	0.052	10/7/2002	0.058
11/26/2002	0	0.021	0.021	10/22/2002	0.05
12/11/2002	0.014		0.019	11/5/2002	0.12
				11/18/2002	0.062
	Moose -lower	**Moose-upper**	**WF Potlatch**		**Big Creek**
Averages	**0.0398**	**0.03428**	**0.0314**		**0.0365**
All 4 averaged	**0.035**				

[a] t/yr = tons per year
DNS = Did not sample

Margin of Safety

Load calculations are assigned by water body for this report. A margin of safety of approximately 5% was applied to the equation to arrive at 0.10 mg/L TP as a load capacity for nutrient TMDLs in the Palouse River Subbasin.

Surrogate Target

In addition to the TP target, the DO readings within Flannigan Creek and Hatter Creek-lower will need to stay above 6.0 mg/L, especially during the growing season.

Seasonal Variation

These nutrient TMDLs only apply during the growing season, May-October of each year. Typically this is the critical period when low DO levels are present because of excess nutrients. BMPs should be applied on the landscape throughout the year as to ensure excessive nutrients do not get into a stream and to ensure the goal of these nutrient TMDLs are achieved.

Flannigan Creek

The nutrient load capacity for Flannigan Creek must meet water quality standards that protect the beneficial uses of salmonid spawning and cold water aquatic life. Samples were collected from both upper (PR17) and lower (PR16) monitoring sites as outlined in the monitoring plan (Appendix A). Data from the lower site revealed six consecutive bi-weekly exceedances of the nutrient target, five TP readings above 0.10 mg/L, and one DO level reading below 6.0 mg/L (Table 5-23). Data from the upper site revealed four consecutive bi-weekly exceedances of the nutrient target, including four consecutive TP readings above 0.10 mg/L.

Hatter Creek

The nutrient load capacity for Hatter Creek must meet water quality standards that protect the beneficial uses of salmonid spawning and cold water aquatic life. Samples were collected from both upper (PR17) and lower (PR161) monitoring sites, as outlined in the monitoring plan (Appendix A). Data from the lower site revealed three consecutive bi-weekly exceedances of the nutrient target, three TP readings at or above 0.10 mg/L and two DO level readings below 6.0 mg/L (Table 5-24). There were no exceedances of the nutrient target at the upper site, therefore the nutrient TMDL is being developed only for the lower section of Hatter Creek.

Table 5-23. Flannigan Creek TP, DO and discharge bi-weekly monitoring results.

Date	PR-16 (TP)[1]	PR-16 (DO)[1]	PR-16 (Discharge)[2]	PR-17 (TP)	PR-17 (DO)	PR-17 (discharge)
5/7/2002	0.07	12.43	14.91	0.07	11.99	12.42
5/21/2002	**0.10**	**9.92**	9.91	0.07	8.34	10.62
6/4/2002	0.09	8.63	3.48	0.09	10.15	5.84
6/18/2002	**0.16**	**7.81**	2.03	**0.14**	**8.50**	2.02
7/3/2002	**0.13**	**7.05**	1.21	**0.19**	**6.74**	1.50
7/16/2002	**0.12**	**7.36**	0.72	**0.14**	**8.28**	0.77
7/29/2002	**0.11**	**6.30**	0.38	**0.14**	**6.97**	0.36
8/18/2002	**0.10**	**5.70**	0.10	0.07	6.79	0.17
8/28/2002	**0.11**	**6.58**	0.21	0.08	7.00	0.34
9/5/2002	**0.10**	**6.82**	0.22	**0.22**	**6.82**	0.33
9/24/2002	0.07	8.23	0.08	0.05	7.90	0.18

Exceedances are in **bold.**
[1] mg/L = milligrams per liter
[2] cfs = cubic feet per second

Table 5-24. Hatter Creek TP, DO and discharge bi-weekly monitoring results.

Date	PR-12 (TP)[1]	PR-12 (DO)[1]	PR-12 (discharge)[2]	PR-13 (TP)	PR-13 (DO)	PR-13 (discharge)
5/7/2002	0.05	12.42	34.46	0.02	12.06	29.08
5/22/2002	0.08	10.62	37.30	0.06	10.50	37.15
6/4/2002	0.05	9.30	17.94	0.05	9.45	15.58
6/18/2002	0.80	9.46	7.06	0.08	8.58	7.52
7/3/2002	0.07	9.38	3.84	0.05	7.93	4.02
7/16/2002	0.08	9.28	1.39	0.06	7.81	2.33
7/29/2002	0.09	8.28	0.59	0.08	6.87	1.44
8/18/2002	**0.10**	**4.70**	0.09	0.06	7.60	0.94
8/28/2002	**0.12**	**7.58**	0.18	0.07	7.43	0.55
9/5/2002	**0.12**	**5.35**	0.01	0.07	7.23	0.63
9/24/2002	0.07	10.66	0.25	0.06	8.42	0.60

Exceedances are in **bold.**
[1] mg/L = milligrams per liter
[2] cfs = cubic feet per second

Flannigan Creek Load Analysis

For Flannigan Creek, the mass per unit volumes for the current load, load capacity and load reduction amounts were calculated based on the discharge data averaged over a period of one month. The first load reduction calculation will occur in June at both sites, followed by load reductions for both sites in July, and a load reduction for the lower site only occurring in August. These load reductions are shown in Table 5-25,and were calculated as follows:

- The existing load was calculated by multiplying the average TP levels in Table 5-23 by the average flows for the monthly time frames shown in Table 5-25.

- The load capacity was calculated by multiplying the TP target (0.1 mg/L) by the average flows in Table 5-23 for the monthly time frame in Table 5-25.

- The load allocation was calculated by subtracting the natural background (0.035 mg/L) from the load capacity. The load reduction was calculated by subtracting the load capacity from the existing load.

Hatter Creek Load Analysis

For Hatter Creek, the mass per unit volumes for the current load, load capacity and load reduction amounts were calculated based on the discharge data for each exceedance averaged over a period of one month. The exceedances in Hatter Creek were between August 15 through Sept 15. This load reduction for Hatter Creek-lower is shown in Table 5-25, and the calculations were done as follows:

- The existing load was calculated by multiplying the average TP levels in Table 5-24 by the average flows in Table 5-24 for the monthly time frame shown in Table 5-25.
- The load capacity was calculated by multiplying the TP target (0.1 mg/L) by the average flows in Table 5-24 for the monthly time frame in Table 5-25.
- The load allocation was calculated by subtracting the natural background (0.035 mg/L) from the load capacity. The load reduction was calculated by subtracting the load capacity from the existing load.

Load Allocation

Load allocations were assigned to Flannigan and Hatter Creek-lower. The load allocation is the load capacity minus the natural background. The values calculated for each 303(d) listed waterbody are displayed in Table 5-25.

Time Frame

The goal of the this TMDL is to reduce the TP load by the load reduction amount and increase DO for those waterbodies identified in Table 5-25. An implementation plan will be completed within 18 months of EPA approval of this TMDL document. Specific actions to comply with this TMDL will be identified within that implementation plan.

Table 5-25. Nutrient loading allocations, existing load and load reductions for Palouse River Subbasin.

Source (Creek)	Month	Pollutant	Existing Load	Load Capacity	Load Allocation	Load Reduction
Flannigan (PR-16)	6/1-6/30	Total Phosphorus	1.883 lbs/day	1.487 lbs/day	1.368 lbs/day	0.396 lbs/day
Flannigan (PR-17)	6/1-6/30	Total Phosphorus	2.397 lbs/day	2.122 lbs/day	1.655 lbs/day	0.275 lbs/day
Flannigan (PR-16)	7/1-7/31	Total Phosphorus	0.501 lbs/day	0.418 lbs/day	0.355 lbs/day	0.083 lbs/day
Flannigan (PR-17)	7/1-7/31	Total Phosphorus	0.743 lbs/day	0.474 lbs/day	0.578 lbs/day	0.269 lbs/day
Flannigan (PR-16)	8/1-8/31	Total Phosphorus	0.087 lbs/day	0.083 lbs/day	0.083 lbs/day	0.004 lbs/day
Hatter (PR-12)	8/15-9/15	Total Phosphorus	0.061 lbs/day	0.051 lbs/day	0.051 lbs/day	0.011 lbs/day

5.4 Sediment TMDLs

Sediment TMDLs were developed for five of the six 303(d) listed streams in this report: Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek, and Rock Creek. The target for the sediment TMDLs was based on the turbidity standard, which states that waters shall not exceed 25 NTU over background levels for greater than 10 days and shall not exceed 50 NTU over background at any time.

In-Stream Water Quality Targets for Sediment

The in-stream water quality target for sediment was developed to restore full support of designated beneficial uses. The in-stream load reduction amount is based on a TSS load measured and calculated in tons per year in the stream, and represented as a load reduction percentage. The TSS load amounts for each 303(d) listed stream were derived from the turbidity standard and from the equations found in Appendix C.

The sediment target (the load capacity) is the state standard of turbidity levels not to exceed 25 NTU above background turbidity levels for a period greater than 10 consecutive days or no more than 50 NTU above background turbidity levels instantaneously. Tables 5-26 through 5-30 display the calculations performed to determine the existing load quantities, background load quantities, load capacity, excess load and load reductions. The next section details how these steps were accomplished.

Design Conditions/Target Selection

The design of a stochastic flow model requires a more thorough discharge profile for each stream than was collected during November 2001 and November 2002 as outlined in the monitoring plan (Appendix A). Ten years of data from USGS Palouse River gage site near the town of Potlatch was gathered and compiled. Modifications were then made to the flows based on watershed size differences between each stream and the Palouse River, elevation, precipitation, geology, land cover, basin slope, and channel characteristics, following the Lipscomb 1998 methodology for each 303(d) listed stream.

Based on the collected data in the monitoring year November 2001-November 2002, numeric relationships between discharge and NTU, discharge and TSS, and NTU and TSS were developed by plotting the values on a graph. These relationships can be expressed as mathematical equations, called regression equations, which were used to calculate values for TSS, NTU, background TSS, background NTU, and TSS levels over background. These regression equations are displayed for Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek and Rock Creek in Appendix C.

These equations were then used to determine existing TSS and NTU values on a daily basis for a ten-year period. The minimum, maximum and average values are displayed in Tables 5-26 through 5-30. A background ratio was calculated by dividing the background erosion value from the total sediment erosion value within the RUSLE model:

1. The background TSS value is calculated by multiplying the background ratio and the existing TSS value.
2. The load capacity is calculated by taking the TSS value equal to 25 NTU, multiplying by daily flow and a conversion factor (to express the load capacity in tons per day), and then adding the background TSS in tons per day.
3. Once the load capacity is determined, the excess load or load reduction is calculated by subtracting the load capacity from the exiting TSS load.
4. The excess load is then expressed in tons per year and a percentage is calculated.

These steps were performed for each 303(d) listed stream. The values showing in Tables 5-26 through 5-30 were calculated on an excel spreadsheet using daily averages over a ten year period, not by taking the average values displayed in Tables 5-26 through 5-30 and placing those values in the equations shown.

Monitoring Points

The monitoring points for TMDL compliance for the sediment TMDLs are the mouths of each stream; however, beneficial uses must be met throughout each 303(d) watershed. During the planning phase of the monitoring for this TMDL, an attempt was made to get a site as close as possible to the mouth, and, in most cases, the lowest downstream monitoring site is the mouth.

Lowest downstream monitoring sites for Deep Creek, and Gold Creek are at the mouth. For Flannigan Creek and Hatter Creek we were not able to access the actual mouth, but the lowest downstream monitoring sites are within a mile of the mouth. Rock Creek's lowest downstream monitoring site is approximately a quarter mile from the mouth. Data from other monitoring points were collected and used to assist with the sediment model calculations but are not the compliance point for the sediment TMDLs.

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Table 5-26. Deep Creek Existing Load, Load Capacity, Load Allocation and Loading Calculations for Sediment.

Parameter[a]	Equation[b]	Minimum	Maximum	Average
Daily Flow for Last 10 Years (cfs)	Derived from Palouse River USGS gage, Lipscomb (1998)correction	0.00	930.52	20.20
Existing TSS, Daily Average (mg/L)[c]	(3.6158 * flow-53.653)	-53.50	3310.92	19.39
Existing TSS (t/day)	TSS (mg/L)* 0.0027 * flow	0.00	8318.38	19.29
Existing TSS, Yearly Average (t/y)	TSS (t/day) * 365	n.a.	n.a.	7040.85
Existing Turbidity (NTU)	3.7602 *flow-40.501	-40.36	2993.18	25.36
Background Ratio[d]	(2477.52 t/y/WB) / (74484.08 t/y/WB)	n.a.	n.a.	0.03 (3%)
Background TSS (mg/L)	(TSS daily average) * (background ratio)	-1.78	110.13	0.64
Background TSS (t/day)	TSS (t/day) * background ratio	0.00	276.69	0.64
Background TSS (t/yr)	0.64 * 365	n.a.	n.a.	233.60
Load Capacity (t/day)	(19.01 mg/L * daily flow * 0.0027) + background TSS (t/day)	0.00	324.44	1.68
Load Capacity (t/yr) Average	1.68 * 365	n.a.	n.a.	613.20
Load Reduction(Excess Load) (t/day)	TSS (t/day) – load capacity	0	7993.94	17.92
Load Reduction(Excess Load) (t/yr)	Excess load TSS (t/day)*365	n.a.	n.a.	6541.15
Load Reduction (%)	Excess load / (TSS – background TSS) yearly average	n.a.	n.a.	0.96 (96%)

a cfs = cubic feet per second, TSS = total suspended solids, mg/L – milligrams per liter, t/day = tons per day, t/y = tons per year, NTU = nephlometric turbidity units
b t/y/WB = tons per year per water body
c From sediment yield curves in Appendix M
d Derived from RUSLE background and total detached numbers for entire watershed
Deep Creek watershed area = 27,315.56 acres or 42.68 square miles
Deep Creek sediment yield equation: 25 NTU Idaho WQS criterion = 23.36 mg/L = (1.1087 * 25 NTU –8.7099)

Table 5-27. Flannigan Creek Existing Load, Load Capacity, Load Allocation and Loading Calculations for Sediment.

Parameter[a]	Equation[b]	Minimum	Maximum	Average
Daily Flow for Last 10 Years (cfs)	Derived from Palouse River USGS gage, Lipscomb (1998)correction	0.04	834.09	18.12
Existing TSS, Daily Average (mg/L) [c]	$(1.3589 * 11.757 * \text{flow}^{0.4051}) – 8.0531$	0.00	234.98	30.12
Existing TSS (t/day)	(TSS) * (flow) * (0.0027)	0.00	529.20	3.98
Existing TSS, Yearly Average (t/y)	TSS (t/day) * 365	n.a.	n.a.	1452.70
Existing Turbidity (NTU)	$11.757 * \text{flow}^{0.4051}$	3.12	178.84	28.09
Background Ratio [d]	(1522.28 t/y/WB) / (35,499.63 t/y/WB)	n.a.	n.a.	0.04 (4%)
Background TSS (mg/L)	(TSS daily average) * (background ratio)	0.00	10.09	1.29
Background TSS (t/day)	TSS (t/day) * background ratio	0.00	22.72	0.17
Background TSS (t/yr) Average	0.17 * 365	n.a.	n.a.	62.10
Load Capacity (t/day)	(25.91 mg/L * daily flow * 0.0027) + background TSS (t/day)	0.001	81.09	1.44
Load Capacity (t/yr) Average	1.44 * 365	n.a.	n.a.	525.60
Load Reduction(Excess Load) (t/day)	TSS (t/day) – load capacity	0	448.11	2.56
Load Reduction(Excess Load) (t/yr)	Excess load TSS (t/day)*365	n.a.	n.a.	937.69
Load Reduction (%)	Excess load / (TSS – background TSS) yearly average	n.a.	n.a.	0.67 (67%)

a cfs = cubic feet per second, TSS = total suspended solids, mg/L – milligrams per liter, t/day = tons per day, t/y = tons per year, NTU = nephlometric turbidity units
b t/y/WB = tons per year per water body
c From sediment yield curves in Appendix M
d Derived from RUSLE background and total detached numbers for entire watershed
Flannigan Creek watershed area = 12,2246.82 acres or 19.14 square miles
Flannigan Creek sediment yield equation: 25 NTU Idaho WQS criterion = 25.91 mg/L = (25 NTU * 1.3589 – 8.0531).

Table 5-28. Gold Creek Existing Load, Load Capacity, Load Allocation and Loading Calculations for Sediment.

Parameter[a]	Equation[b]	Minimum	Maximum	Average
Daily Flow for Last 10 Years (cfs)	Derived from Palouse River USGS gage, Lipscomb (1998) correction	0.05	1045.71	22.70
Existing TSS, Daily Average (mg/L)[c]	(0.265*(10.629 * flow $^{0.4292}$)) + 8.7604	9.57	68.46	17.26
Existing TSS (t/day)	(TSS) * (flow) * (0.0027)	0.00	193.28	1.81
Existing TSS, Yearly Average (t/y)	TSS (t/day) * 365	81.99	1359.74	661.65
Existing Turbidity (NTU)	10.629 * flow $^{0.4292}$	3.07	225.28	32.08
Background Ratio[d]	(2009.36 t/y/WB) / (55783.22 t/y/WB)	n.a.	n.a.	0.04 (4%)
Background TSS (mg/L)	(TSS daily average) * (background ratio)	0.34	2.47	0.62
Background TSS (t/day)	TSS (t/day) * background ratio	0.00	6.96	0.07
Background TSS (t/yr)	0.07 * 365	n.a.	n.a.	25.55
Load Capacity (t/day)	(15.39 mg/L * daily flow * 0.0027) + background TSS (t/day)	0.00	50.00	1.01
Load Capacity (t/yr) Average	1.01 * 365	n.a.	n.a.	368.65
Load Reduction(Excess Load) (t/day)	TSS (t/day) – load capacity	0	142	0.81
Load Reduction(Excess Load) (t/yr)	Excess load TSS (t/day)*365	n.a.	n.a.	294.47
Load Reduction (%)	Excess load / (TSS – background TSS) yearly average	n.a.	n.a.	0.46 (46%)

a cfs = cubic feet per second, TSS = total suspended solids, mg/L – milligrams per liter, t/day = tons per day, t/y = tons per year, NTU = nephlometric turbidity units
b t/y/WB = tons per year per water body
c From sediment yield curves in Appendix M
d Derived from RUSLE background and total detached numbers for entire watershed
Gold Creek watershed area = 18,069.78 acres or 28.23 square miles
Gold Creek sediment yield equation: 25 NTU Idaho WQS criterion = 23.36 mg/L = (0.265 * 25 NTU +8.7604)

Table 5-29. Hatter Creek Existing Load, Load Capacity, Load Allocation and Loading Calculations for Sediment.

Parameter[a]	Equation[b]	Minimum	Maximum	Average
Daily Flow for Last 10 Years (cfs)	Derived from Palouse River USGS gage, Lipscomb (1998)correction	0.05	1045.49	22.70
Existing TSS, Daily Average (mg/L)[c]	$(1.6737 * 9.5351 * \text{flow}^{0.3361}) - 16.032$	0.00	149.09	18.25
Existing TSS (t/day)	(TSS) * (flow) * (0.0027)	0.00	420.85	3.35
Existing TSS, Yearly Average (t/y)	TSS (t/day) * 365	n.a.	n.a.	1222.75
Existing Turbidity (NTU)	$9.5351 * \text{flow}^{0.3361}$	3.41	98.66	20.48
Background Ratio[d]	(1671.30 t/y/WB) / (9387.73 t/y/WB)	n.a.	n.a.	0.18 (18%)
Background TSS (mg/L)	(TSS daily average) * (background ratio)	0.00	26.54	3.25
Background TSS (t/day)	TSS (t/day) * background ratio	0.00	74.92	0.60
Background TSS (t/yr)-Average	0.60 * 365	n.a.	n.a.	219.00
Load Capacity (t/day)	(25.81 mg/L * daily flow * 0.0027) + background TSS (t/day)	0.00	147.78	2.18
Load Capacity (t/yr)	2.18 * 365	n.a.	n.a.	795.7
Load Reduction(Excess Load) (t/day)	TSS (t/day) – load capacity	0	273.06	1.28
Load Reduction(Excess Load) (t/yr)	Excess load TSS (t/day)*365	n.a.	n.a.	466.77
Load Reduction (%)	Excess load / (TSS – background TSS) yearly average	n.a.	n.a.	0.46 (46%)

a cfs = cubic feet per second, TSS = total suspended solids, mg/L – milligrams per liter, t/day = tons per day, t/y = tons per year, NTU = nephlometric turbidity units
b t/y/WB = tons per year per water body
c From sediment yield curves in Appendix M
d Derived from RUSLE background and total detached numbers for entire watershed
Hatter Creek watershed area = 16,181.00 acres or 25.28 square miles
Hatter Creek sediment yield equation: 25 NTU Idaho WQS criterion = 25.81 mg/L = (25 NTU * 1.6737 – 16.032)

Table 5-30. Rock Creek Existing Load, Load Capacity, Load Allocation and Loading Calculations for Sediment.

Parameter[a]	Equation[b]	Minimum	Maximum	Average
Daily Flow for Last 10 Years (cfs)	Derived from Palouse River USGS gage, Lipscomb (1998)correction	0.00	211.31	4.59
Existing TSS, Daily Average (mg/L)[c]	7.5262 * flow $^{0.5005}$	0.00	109.70	11.88
Existing TSS (t/day)	(TSS) * (flow) * (0.0027)	0.00	62.59	0.41
Existing TSS, Yearly Average (t/y)	TSS (t/day) * 365	n.a.	n.a.	147.88
Existing Turbidity (NTU)	20.708 * flow $^{0.3939}$	0.00	170.58	27.95
Background Ratio[d]	(602.34 t/y/WB) / (7218.27 t/y/WB)	n.a.	n.a.	0.08 (8%)
Background TSS (mg/L)	(TSS daily average) * (background ratio)	0.00	9.15	0.99
Background TSS (t/day)	TSS (t/day) * background ratio	0.00	5.22	0.03
Background TSS (t/yr) Average	0.03 * 365	n.a.	n.a.	12.34
Load Capacity (t/day)	(9.36 mg/L * daily flow * 0.0027) + background TSS (t/day)	0.00	10.67	0.15
Load Capacity (t/yr) Average	0.15 * 365	n.a.	n.a.	54.75
Load Reduction(Excess Load) (t/day)	TSS (t/day) – load capacity	0	51.92	0.26
Load Reduction(Excess Load) (t/yr)	Excess load TSS (t/day)*365	n.a.	n.a.	94.90
Load Reduction (%)	Excess load / (TSS – background TSS) yearly average	n.a.	n.a.	0.69 (69%)

a cfs = cubic feet per second, TSS = total suspended solids, mg/L – milligrams per liter, t/day = tons per day, t/y = tons per year, NTU = nephlometric turbidity units
b t/y/WB = tons per year per water body
c From sediment yield curves in Appendix M
d Derived from RUSLE background and total detached numbers for entire watershed
Rock Creek watershed area = 5174.76 acres or 8.09 square miles
Rock Creek sediment yield equation: 25 NTU Idaho WQS criterion = 9.36 mg/L = (1.3586 *25 NTU –24.601)

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Load Capacity

The load capacity is the amount of pollutant a water body can receive without violating water quality standards. The load capacity for Deep Creek, Flannigan Creek, Gold Creek, Hatter Creek, and Rock Creek is also set at a level that fully supports beneficial uses. Seasonal variations, background levels, and an MOS to account for any uncertainty are calculated within the load capacity.

The load capacity was calculated based on the relationship between turbidity in NTUs and the TSS in milligrams per liter (mg/L), resulting in a calculation of the amount of TSS, in milligrams per liter, that 25 NTUs from the state water quality standards represent. For example, in Deep Creek, 25 NTUs is equivalent to 23.36 mg/L TSS. The load capacity is represented in tons per day averaged over a period of ten years. The load capacity varies with flow, as does the background load. The flow is highest in the period January through May. Tables 5-26-5-30 display the load capacities for each sediment TMDL.

Estimates of Background Sediment Loading

Regulations allow that “loadings”…may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading,” (Water quality planning and management, 40 CFR 130.2(I)). There are no point sources within the 303(d) watersheds assessed within this report. The nonpoint sources were estimated using a stochastic flow model. Background sediment loading was developed from the flow model, regression equations, and a background ratio. The background ratio was calculated using the routed background erosion for all areas upstream of the mouth divided by the total tons of sediment routed from a watershed within the RUSLE model. Tables 5-26 through 5-30 display the background loads.

Load Allocation

Load allocations are assigned by waterbody for this report. Individual sources were identified and quantified using various methodologies and are presented in Appendix D but are not part of the sediment TMDL. The load allocation is based on the flow model and loading calculations; it is the load capacity minus the natural background. A value was calculated for each 303(d) listed waterbody and is displayed in Table 5-31.

Margin of Safety

The loading calculations in Tables 5-26 through 5-30 used 25 NTU over background. A standard violation occurs when sediment levels exceed 25 NTU over background for a period greater than 10 consecutive days. DEQ used the 25 NTU over background instead of the 50 NTU because each 303(d) stream was in violation of the 25 NTU standard for at least 10 days. But DEQ is applying this approach to the sediment TMDLs on a daily basis over the course of a year, not a ten-day basis within a year. Mathematically this is could be represented as almost a 50% margin of safety.

Twenty-five NTUs was also used because increased sediment levels over background has the potential to negatively effect beneficial uses. This methodology has been used in several other approved TMDLs, such as the South Fork Clearwater River TMDL and the Cottonwood Creek TMDL. By using the 25 NTU—not 50 NTU—above background, a very significant MOS has all ready been supplied; therefore, no further load allocation to MOS has been built into the TMDLs. The use of the 25 NTU standard in the loading calculations is also justified because it is the standard for the current situation; however, as compliance with the TMDL is accomplished, the 50 NTU over background instantaneous criterion is the only one that can be applied if there are no exceedances greater than 10 days duration.

Seasonal Variation

All of the exceedances took place from January through May of each year (spring runoff). The sediment TMDL is shown as an annual load reduction. BMPs to reach the sediment reductions should be applied throughout the year as erosion occurring in the uplands in the fall could eventually reach a running stream in the winter or spring.

Reserve

By making a sediment load capacity based on the state standard, any future growth will have been in compliance with the state standards. The relationships between TSS and NTU that have been established in this TMDL will be applicable to any future non-point or point source loads.

Load Reduction

The load reductions are displayed as total tons per year and as a percentage in Table 5-31. To reach the load reductions stated below, the amount of TSS measured in the streams will have to be lowered during the winter and spring seasons, as this is when the majority of the sediment is being transported. This reduction needs to be applied throughout the entire watershed.

Table 5-31. Sediment allocations, existing load and load reductions for Palouse River Subbasin.

Source (Creek)	Existing Load[a]	Load Capacity[a]	Back-ground[a]	Load Allocation[a]	Load Reduction[a]	Load Reduction (%)
Deep	7040.85 t/yr	613.20 t/yr	233.60 t/yr	379.60 t/yr	6541.15 t/yr	96%
Flannigan	1452.70 t/yr	525.60 t/yr	62.10 t/yr	463.55 t/yr	937.69 t/yr	67%
Gold	661.65 t/yr	368.65 t/yr	25.55 t/yr	343.10 t/yr	294.47 t/yr	46%
Hatter	1222.75 t/yr	795.70 t/yr	219.00 t/yr	546.70 t/yr	466.77 t/yr	46%
Rock	147.88 t/yr	54.75 t/yr	12.34 t/yr	42.41 t/yr	94.90 t/yr	69%

[a] t/yr = tons per year

Time Frame

The goal of this TMDL is to reduce the sediment loads by the load reduction percentages in Table 5-31. An implementation plan will be completed within 18 months of EPA approval of this TMDL document. Specific actions to comply with this TMDL will be identified within that implementation plan.

Construction Storm Water and TMDL Waste Load Allocations

Construction Storm Water

The Clean Water Act requires operators of construction sites to obtain permit coverage to discharge storm water to a water body or to a municipal storm sewer. In Idaho, EPA has issued a general permit for storm water discharges from construction sites. In the past storm water was treated as a non-point source of pollutants. However, because storm water can be managed on site through management practices or when discharged through a discrete conveyance such as a storm sewer, it now requires a National Pollution Discharge Elimination System (NPDES) Permit.
The Construction General Permit (CGP)

If a construction project disturbs more than one acre of land (or is part of larger common development) that will disturb more than one acre), the operator is required to apply for permit coverage from EPA after developing a site-specific Storm Water Pollution Prevention Plan.

Storm Water Pollution Prevention Plan (SWPPP)

In order to obtain the Construction General Permit operators must develop a site-specific Storm Water Pollution Prevention Plan. The operator must document the erosion, sediment, and pollution controls they intend to use, inspect the controls periodically and maintain the best management practices (BMPs) through the life of the project

Construction Storm Water Requirements

By making a sediment load capacity based on the state standard, any future growth will have to comply with the TMDL target. TMDLs developed in the past that did not have a WLA for construction storm water activities will also be considered in compliance with provisions of the TMDL if they obtain a CGP under the NPDES program and implement the appropriate Best Management Practices.

Typically there are specific requirements you must follow to be consistent with any local pollutant allocations. Many communities throughout Idaho are currently developing rules for post-construction storm water management. Sediment is usually the main pollutant of concern in storm water from construction sites. The application of specific best management practices from *Idaho's Catalog of Storm Water Best Management Practices for Idaho Cities and Counties* is generally sufficient to meet the standards and requirements of the General

Construction Permit, unless local ordinances have more stringent and site specific standards that are applicable.